

On the Marine Fauna of the Gulf of Kutch

PART II—GASTROPODS

BY

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(With ten plates)

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INTRODUCTION

The molluscans of the Gulf of Kutch have not yet been studied in a comprehensive manner. Hornell (1916), in one of the pioneering works on the marine zoology of Okha Mandal, described the most common forms. The second attempt to study the marine fauna of the Gulf of Kutch was undertaken by the Department of Zoology, Birla College, Pilani, in 1956 (Gideon *et al.*, 1957). The present account is based mainly on shells collected in three surveys made after that between June 1956 and October 1958. Compared with the Gulf of Kutch the littoral molluscan fauna of the Bombay coast has been better studied (Melvill, 1893, 1894, 1896; Melvill & Abercrombie, 1893; Melvill & Standen, 1906).

The present study is undertaken with the additional aim of studying the distribution of molluscans in the Gulf of Kutch and its comparison with the other well-surveyed Indian coastal regions (Subramaniam *et al.*, 1951; Gravely, 1927, 1942; Satyamurthi, 1952). It is certain that several species are common to all these places but at the same time there are a few which are characteristic of each place. The authors believe that there are still a number of Gastropods in this region which have not been collected. A key to the identification of the Gastropods of the Gulf of Kutch will be published after more material has been studied.

MATERIALS AND METHODS

The material for the present study was collected from Port Okha, Pirotan Island, Byet Dwarka, and Sika. The collections were made mostly from the intertidal zone, both in the morning and in the evening. The low tide allowed two to three hours of collection in the morning and one to two hours in the evening.

Live specimens were narcotised before preservation. The classification followed is that of Thiele (1931) as adopted by Satyamurthi (1952).

DESCRIPTION OF THE AREA SURVEYED

In addition to the regions already described (Gideon *et al.*, 1957) the present survey covers the Beacon area of Pirotan Island and Sika 6 miles off Kanalus:

Beacon area. The Beacon area is mainly sandy interspersed with broken coral rock. At low tide there is three to six inches of water over the rocks, which are covered by a thin layer of mud. This region is marked by the presence of a large number of *Octopus*, *Onchidium*, and *Tetradon*.

Sika. The intertidal zone of Sika is muddy and very vast. The mud is deposited over coral rocks and is waist deep in places. This area is surveyed for the first time.

Family FISSURELLIDAE

This family is represented by three genera and five species, as a rule not very abundant. The three genera described here also occur on the east coast of India (Satyamurthi, 1952). Hornell's (1951) revised catalogue of Bombay Mollusca includes four genera of Fissurellidae.

Genus *Diodora* Gray Syn. *Glyphis* Carpenter

The members of this genus are mostly confined to the rocky shores of Okha and Hanuman Dandi. Hornell (1951) observed that they live below low-tide mark and are seldom found except by dredging. This may be true of some species of *Diodora* but in the present survey a large number of living specimens were collected from the rocky shore of Hanuman Dandi. In this area even in the spring tides a large number of rock pools are cut off among the rocks and these specimens were collected from the rocks which surround these

rock pools. They are found associated with members of Patellidae, Neritidae, and Turbinidae.

The members of this genus are known as the key-hole limpets because of the presence of an oval or rounded aperture at the apex of the conical shell. The shell is generally provided with radial and trans-spiral ribs. The shape and size vary greatly even within the species.

***Diodora bombayana* (Sowerby) (Plate 1, Figs. 1 & 2)**

Collected from Okha and Hanuman Dandi. It is the only species of this genus collected alive. In their natural environment most of them are covered with algae and it is difficult to distinguish *Diodora* from *Cellana*.

***Diodora funiculata* (Reeve) (Plate 1, Figs. 3 & 4)**

Only empty shells were collected from Okha and Hanuman Dandi.

***Diodora ticaonica* (Reeve) (Plate 1, Figs. 5 & 6)**

Collected from Hanuman Dandi.

Genus *Emarginula* Lamarck

The genus is represented by a single species. The shells are popularly known as slit limpets and can be easily identified from *Diodora* by the presence of a slit on the anterior margin of the shell along the middle line.

***Emarginula elongata* (Phil.) (Plate 1, Fig. 7)**

Collected from Pirotan Island.

Genus *Scutus* Montfort

The genus is represented by a single species. The most characteristic feature is the presence of a marginal notch. The shell is flat and elongated and it does not cover the body of the animal completely. There is no radial sculpture on the outer surface of the shell. There is a line running all around the margin of the shell forming a ring which is incomplete anteriorly.

***Scutus unguis* (Linn.) (Plate 1, Fig. 8)**

Living specimens collected from the Beacon area of Pirotan Island.

Family **PATELLIDAE**

The family Patellidae is represented only by a single genus and a single species.

Genus **Cellana** H. Adams

The shell is conical and the inner surface of the shell has got a pearly lustre. The shells are popularly known as true limpets and can be easily recognised from the key-hole limpets by the absence of the apical aperture. The surface of the shell in its habitat is covered by greenish algae which match very well with the colour of the environment.

Cellana radiata (Born) (Plate 1, Fig. 9)

They are abundant in Hanuman Dandi, common in Okha.

Family **TROCHIDAE**

Genus **Trochus**

The shells are conical in shape. The lower part of the body-whorl is angular with flattened base. The outer surface of the shell is sculptured and the umbilicus is usually present. These are commonly found attached to the rocks at low tide.

Trochus stellatus Gmelin (Plate 2, Fig. 10)

Collected from Hanuman Dandi. This species is comparatively rare.

Trochus radiatus Gmelin (Plate 2, Fig. 11)

Collected from Hanuman Dandi.

Genus **Monodonta** Lamarck

The shell is trochiform with inflated body-whorl. The surface is provided with minute spiral ribs. The aperture is ovate. There is no umbilicus. The outer lip is thick and ridged throughout while there is a strong tooth in the inner lip. The shell is purple in colour with white spots alternating with brown elongated spots.

Monodonta australis Lamarck (Plate 2, Fig. 12)

Very common in the coral reefs of Hanuman Dandi.

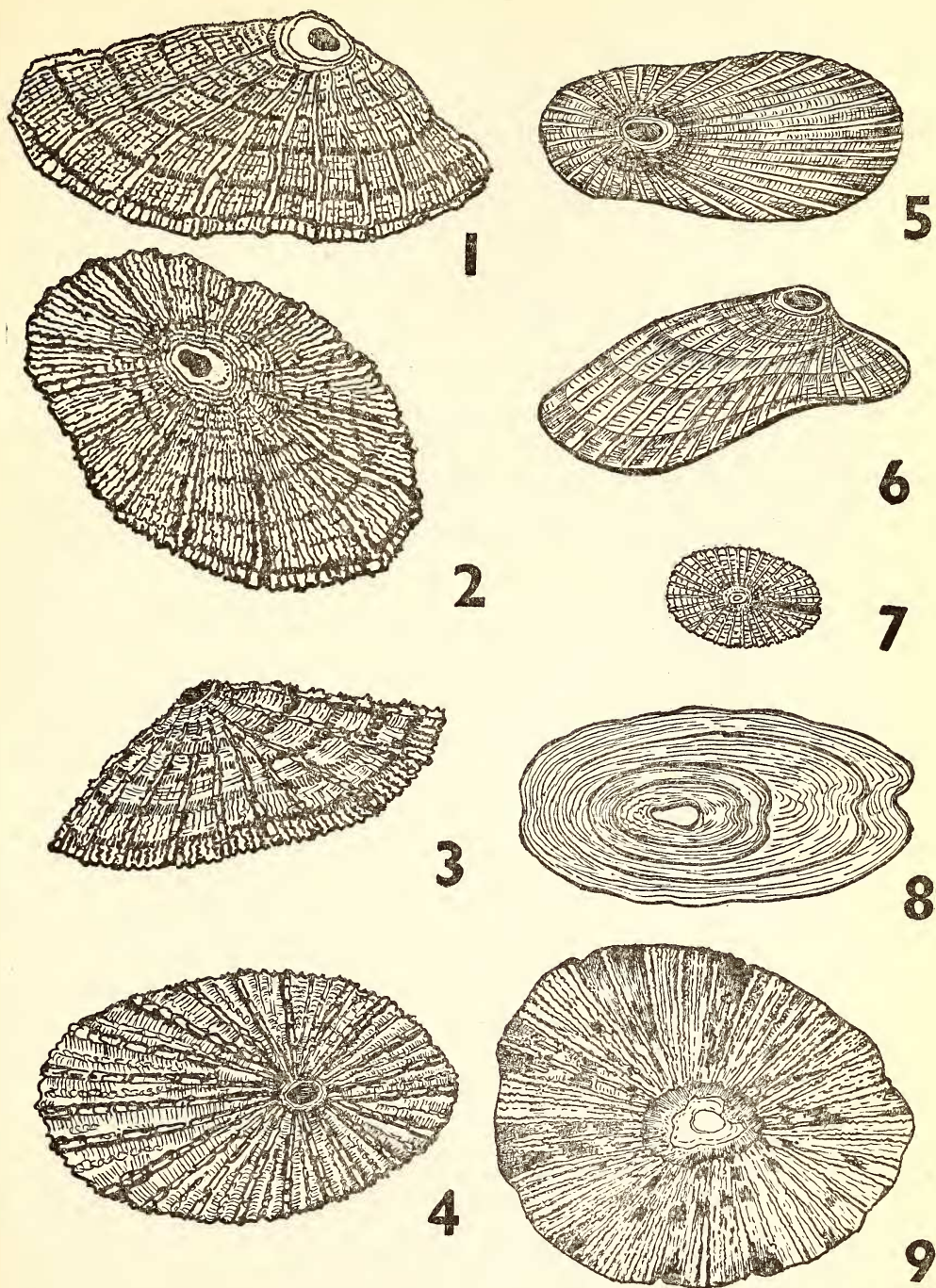


Fig. 1. *Diodora bombayana*: side view $\times 1\frac{1}{2}$; Fig. 2. *D. bombayana*: from above $\times 1\frac{1}{2}$; Fig. 3. *D. funiculata*: side view $\times 1\frac{1}{2}$; Fig. 4. *D. funiculata*: from above $\times 1\frac{1}{2}$; Fig. 5. *D. ticaonica*: from above $\times 1\frac{1}{2}$; Fig. 6. *D. ticaonica*: side view $\times 1\frac{1}{2}$; Fig. 7. *Emarginula elongata*: from above $\times 1\frac{1}{2}$; Fig. 8. *Scutus unguis*: from above; Fig. 9. *Cellana radiata*: from above $\times 1\frac{1}{2}$.

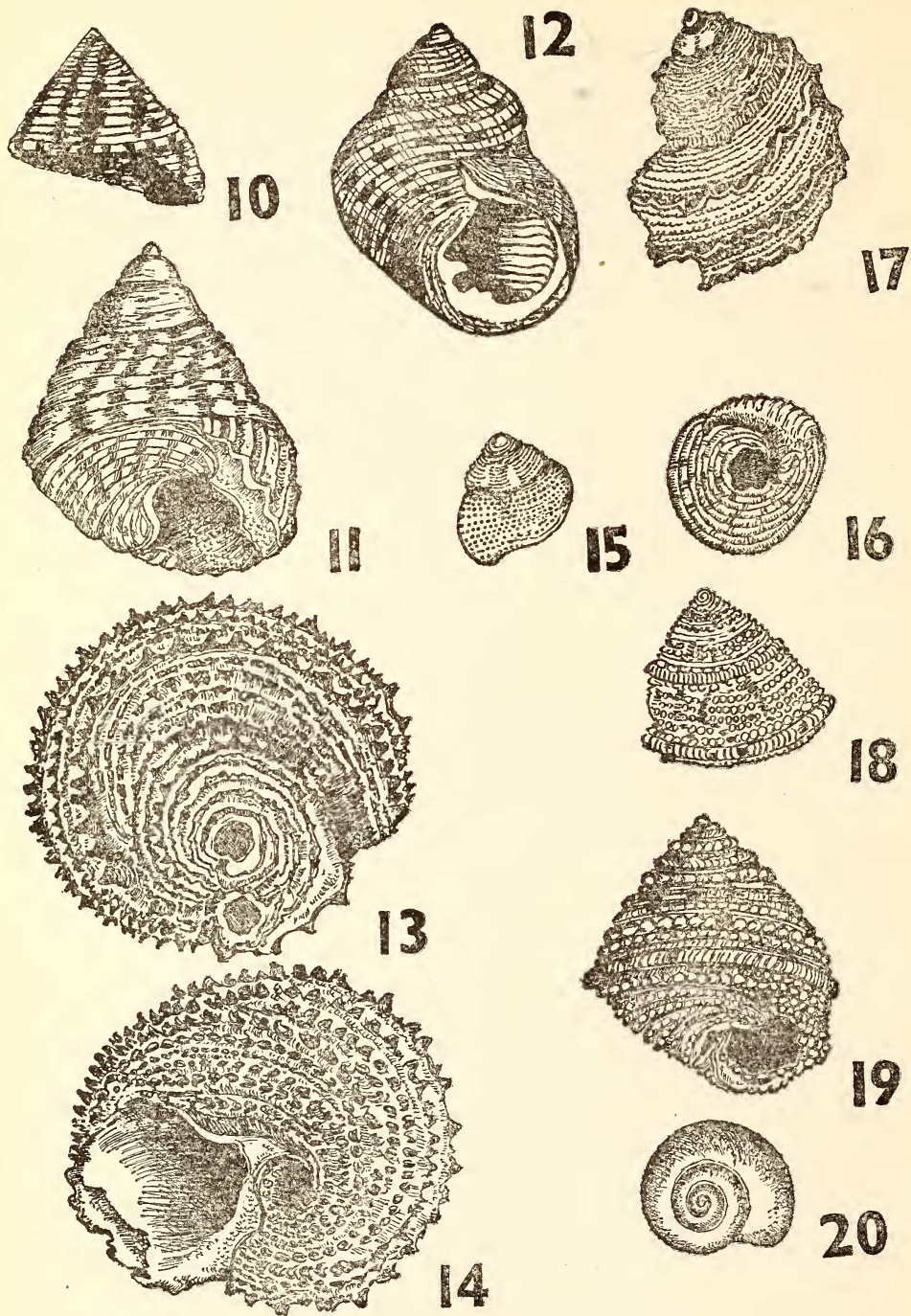


Fig. 10. *Trochus stellatus* : side view ; Fig. 11. *T. radiatus* : showing the base and the aperture ; Fig. 12. *Monodonta australis* : showing the aperture ; Fig. 13. *Angaria plicata* : from above ; Fig. 14. *A. plicata* : from below ; Fig. 15. *Clanculus microdon* : showing the body-whorl ; Fig. 16. *C. microdon* : showing the base ; Fig. 17. *Euchelus asper* : side view ; Fig. 18. *Callistoma* sp. : side view ; Fig. 19. *Callistoma* sp. : showing the base and the aperture ; Fig. 20. *Umbonium vestiarium* : showing the apex.

Genus **Angaria** Röding

It is represented by a single species. The shell is characterised by a low flattened spire. The outer surface of the shell is covered by large spiny processes. The spines are arranged in spiral rows. A large umbilicus is present. The shell is thick, massive and reddish in colour.

Angaria plicata (Kiener) (Plate 2, Figs. 13 & 14)

Living specimens were collected from the low-tide mark of Pirotan Island and were found attached to the smaller broken rocks.

Genus **Clanculus** Montfort

The shell is conical with rounded whorls. The outer surface is smoothly sculptured consisting of beaded spiral ridges. The umbilicus is rounded, large, and toothed inside. The shell is dark reddish-brown with white spots.

Clanculus microdon A. Adams (Plate 2, Figs. 15 & 16)

Collected from Hanuman Dandi.

Genus **Euchelus** Phil.

The genus is represented by a single species. The shell in general shape is rounded with a somewhat inflated body whorl. The suture is deep. The surface of the shell bears granular spiral ridges which are very prominent below the suture. The shell is reddish brown in colour.

Euchelus asper Gmelin (Plate 2, Fig. 17)

Collected from Hanuman Dandi.

Genus **Calliostoma** Swainson

The shell is conical, broader than high, with a pointed apex. The body whorl is angular and spirally sculptured. The beaded spiral ridges are very prominent in the lowermost whorl, while in the upper whorl they are feeble. There is no umbilicus. The shell is whitish.

Calliostoma sp. (Plate 2, Figs. 18 & 19)

Collected from Hanuman Dandi.

Genus **Umbonium** Link

The shells are generally known as button shells. Members of this genus comprise some of the most common and abundant shells on the sandy area of Pirotan Island. This shell is small, brightly coloured, and highly polished. The spire is depressed and the body-whorl is inflated with an angular base. The aperture is somewhat D-shaped. The umbilicus is absent and is filled up by a whitish callus. There is a wide range of colour variation within a species.

Umbonium vestiarius (Linn.) (Plate 2, Fig. 20)

This species was not found in Hanuman Dandi, Balarpur Bay, or Sika. Many shells collected from Pirotan Island were harbouring hermit crabs.

Family **TURBINIDAE**

The shells of this family are known as turban shells though all of them are not turban-like. *Astrea* looks very similar to top shells. The operculum is stony.

Genus **Turbo** Linn.

The shells are of moderate size with a rounded and inflated body-whorl. The aperture is round and the operculum is hard and stony.

Turbo intercostalis Menke (Plate 3, Fig. 21)**Turbo coronatus** Gmelin (Plate 3, Fig. 22)

Next to *Cellana* these are perhaps the most common molluscs in Hanuman Dandi and Okha.

Genus **Astrea** (Bolten) Röding

The shell is top-shaped without an umbilicus. The body-whorls are spinous and the base is flattened. The shell in general appearance resembles a *Trochus*. The colour is pale yellowish brown.

Astrea semicostata (Kiener) (Plate 3, Fig. 23)

Collected from Hanuman Dandi.

Family **NERITIDAE**

This family is represented in the Gulf of Kutch by a single genus and three species.

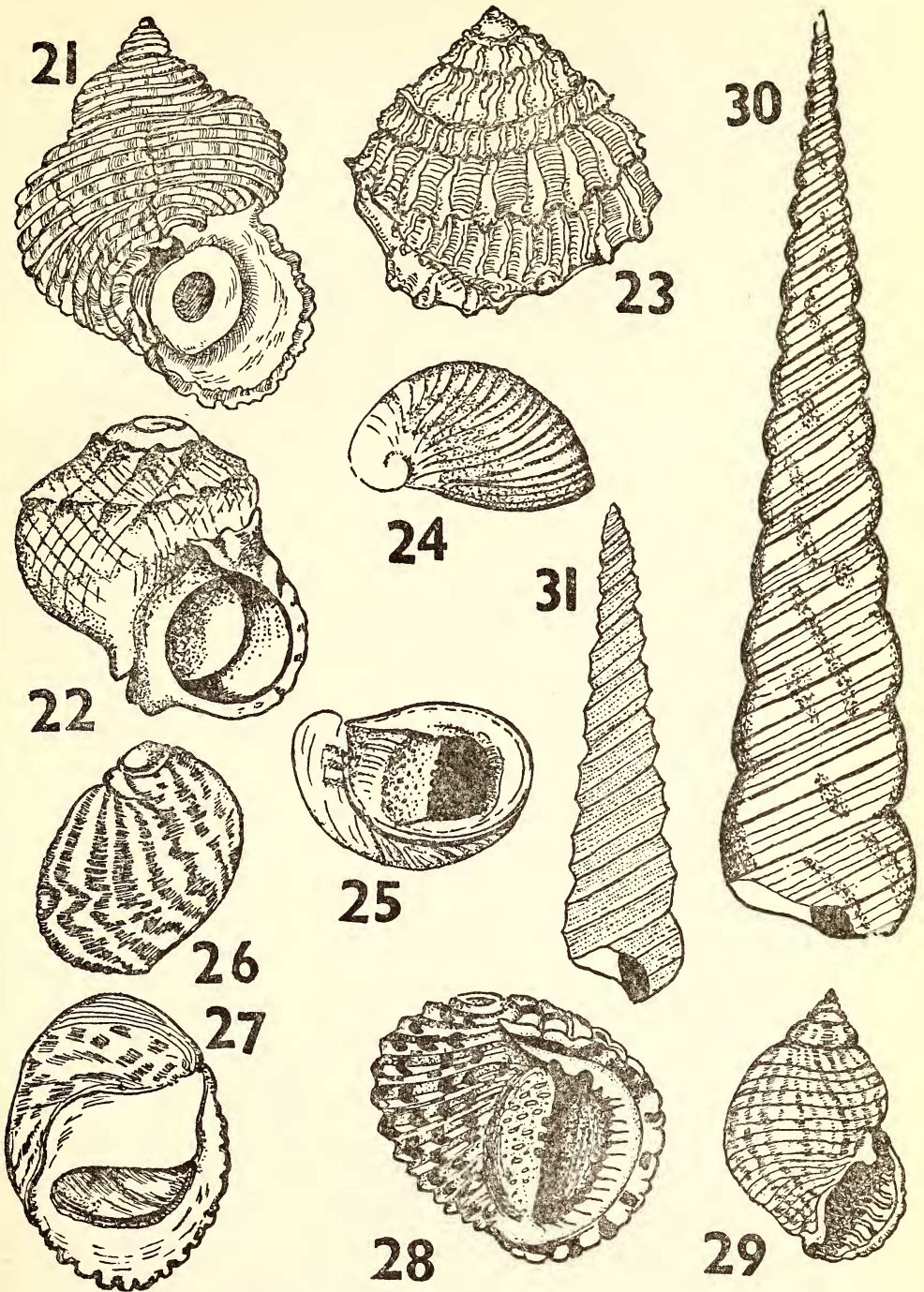


Fig. 21. *Turbo intercostalis* : showing the operculum ; Fig. 22. *T. coronatus* : showing the aperture ; Fig. 23. *Astrea semicostata* : showing the ridges ; Fig. 24. *Nerita albicilla* : side view ; Fig. 25. *N. albicilla* : showing the aperture ; Fig. 26. *N. dombeyi* : showing the body-whorl ; Fig. 27. *N. dombeyi* : showing the aperture ; Fig. 28. *N. plexa* : showing the aperture ; Fig. 29. *Littorina undulata* : aperture side ; Fig. 30. *Turritella acutangula* ; Fig. 31. *T. columnaris*.

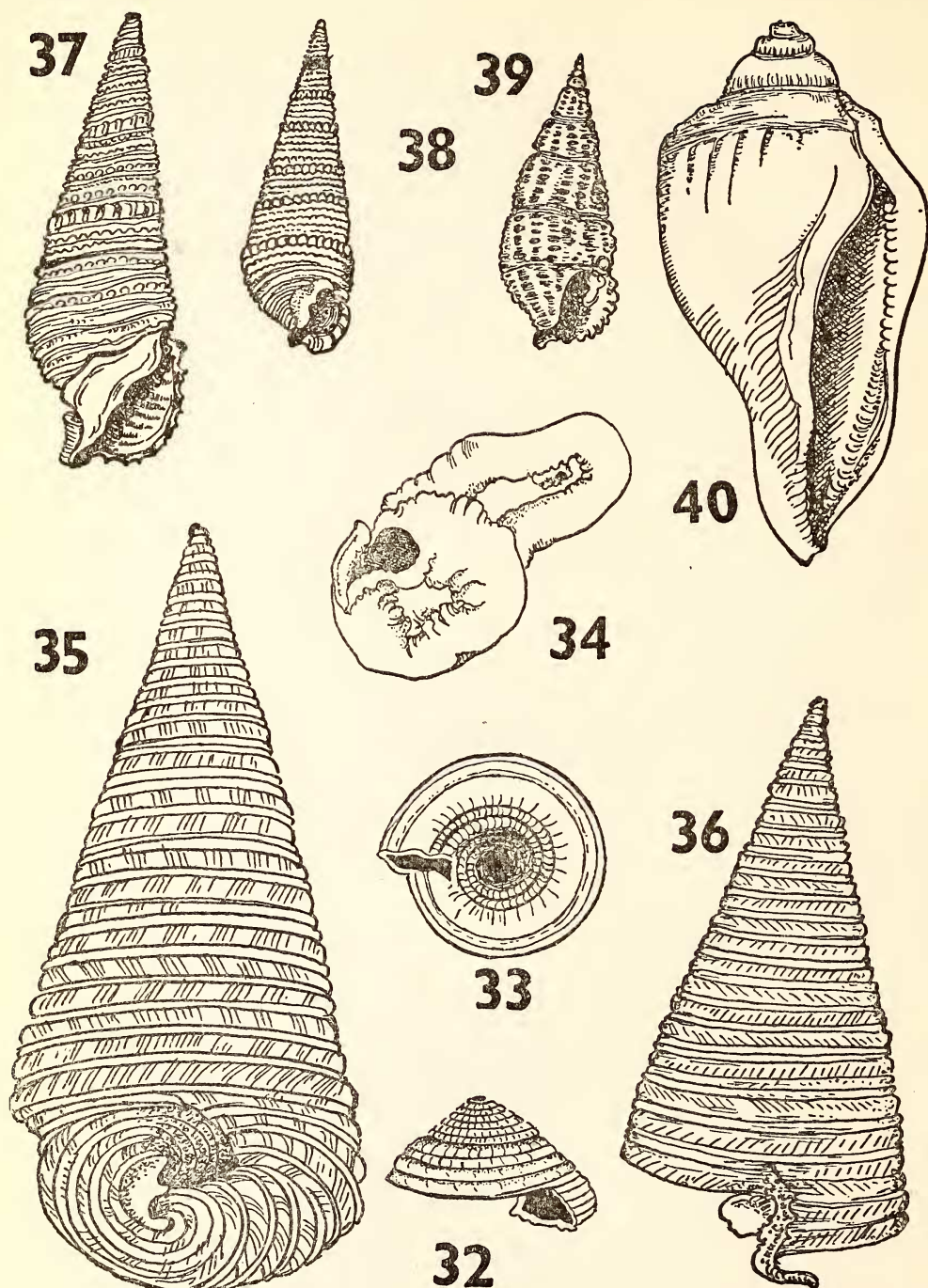


Fig. 32. *Architectonica laevigata* : side view; Fig. 33. *A. laevigata* : from below; Fig. 34. *Vermetes* sp.; Fig. 35. *Telescopium telescopium* : showing the base; Fig. 36. *T. telescopium* : side view; Fig. 37. *Cerithidea fluviatilis* : showing the aperture; Fig. 38. *Cerithium obeliscus* $\times 1\frac{1}{2}$; showing the aperture; Fig. 39. *C. scabridum* $\times 1\frac{1}{2}$; Fig. 40. *Strombus urecus* : aperture side.

Genus **Nerita** Linn.

The shells are thick and are characterised by a large body-whorl and a depressed spire. In some cases the spire may be absent. It has got a D-shaped opercular opening. The umbilicus is absent. The size, shape, and colour of the shells are variable. Living specimens of this genus are abundant in Hanuman Dandi and Okha; no specimens have been collected from Pirotan Island or Balarpur Bay.

Nerita albicilla Linn. (Plate 3, Figs. 24 & 25)

Collected from Hanuman Dandi and Okha.

Nerita dombeyi Récluz (Plate 3, Figs. 26 & 27)

Collected from Hanuman Dandi. Very rare.

Nerita plexa Chemnitz (Plate 3, Fig. 28)

Living specimens were collected from Pirotan Island.

Family **LITTORINIDAE**

They are popularly known as periwinkles. According to Hornell (1951) they are found on rocky shores of all parts of the world. The shells are *Turbo*-like in form but differ from it by the absence of the pearly inner lining. The operculum is horny. Only one genus has been found.

Genus **Littorina** Férussac

Littorina undulata Gray (Plate 3, Fig. 29)

Collected from Hanuman Dandi.

Family **TURRITELLIDAE**

Popularly known as 'turret' or screw shells. They are represented by a single genus and are widely distributed in the Gulf of Kutch.

Genus **Turritella** Lamarck

Turritella acutangula (Linn.) (Plate 3, Fig. 30)

Collected from Hanuman Dandi.

Turritella columnaris (Kiener) (Plate 3, Fig. 31)

Collected from Hanuman Dandi.

Family **ARCHITECTONIDAE** (= **SOLARIIDAE**) (Bolten) Röding

Generally known as staircase shells. The umbilicus resembles a winding staircase. Only one genus is recorded.

Genus **Architectonica** (Bolten) Röding

The shell is broad with an angular lower edge and a flattened base.

Architectonica laevigata Lamarck (Plate 4, Figs. 32 & 33)

Collected from Hanuman Dandi.

Family **VERMETIDAE**

They are known as worm shells and are generally confused with the tube of Polychaetes. The shell is irregularly coiled, the aperture is small, and the foot is reduced.

Genus **Vermetes** (Adanson) Daudin

Vermetes sp. (Plate 4, Fig. 34)

Large numbers of living specimens were collected from Pirotan Island and Hanuman Dandi. Fine threads of mucus emerging from the operculum are characteristic of this gastropod. They are found in association with tubicolous Polychaetes.

Family **POTAMIDIDAE**

Popularly known as telescope shells. Two genera are recorded.

Genus **Telescopium** Linn.

The shell is elongated and its whorls are spirally ribbed. It has got a broad flattened angular base. The shell is gradually narrowing towards the apex. The ribs are alternately dark brown and light brown in colour.

Telescopium telescopium Linn. (Plate 4, Figs. 35 & 36)

Collected from Pirotan Island, Hanuman Dandi, and Balarpur Bay.

Genus **Cerithidea** Swainson

The shell is narrow and elongated. The surface is ornamented with small tubercles which are arranged in regular transpiral rows. The aperture is ovate and the outer lip is expanded. The shell is dark grey in colour.

Cerithidea fluviatilis (Potié & Michaud) (Plate 4, Fig. 37)

Found everywhere.

Family **CERITHIIDAE**

Popularly known as horn shells. According to Hornell (1951) these gastropods have a tendency to migrate from sea to land.

Genus **Cerithium** Bruguière

The shell is tower-shaped and the apex is drawn into an elongated spire. It resembles somewhat the turret shells but differ from them in having a widely channelled aperture and an everted thickened lip. The surface is ornamented with small tubercles.

Cerithium obeliscus Bruguière (Plate 4, Fig. 38)

Collected from Pirotan Island and Balarpur Bay.

Cerithium scabridum Phil. (Plate 4, Fig. 39)

Collected from Pirotan Island and Balarpur Bay.

Family **CALYPTRAEIDAE**

This family is represented by a single genus. The shells are generally known as crucible shells. It is conical or cap-shaped with an eccentric pointed apex. The interior of the shell is provided with a folded appendage.

Genus **Calyptraea** Lamarck**Calyptraea** sp. (Plate 10, Figs. 85 & 86)

Collected from Pirotan Island.

Family **STROMBIDAE**

Popularly known as wing shells.

Genus **Strombus** Linn.

The shell is very thick, smooth with the spire considerably wider and less elevated. The aperture is elongated and narrow and the

outer lip is everted into a wing-like expansion. The columella bears a thick callus.

Strombus urecus Linn. (Plate 4, Fig. 40)

Collected from Hanuman Dandi.

Family NATICIDAE

The family is represented by two genera.

Genus **Natica** Scopoli

The shell is globular with a depressed spire. It is highly polished. The operculum is horny. The body-whorl is very large. An umbilicus is always present, and the callus is very thick.

Natica tigrina (Röding) (Plate 5, Figs. 41 & 42)

Collected from coral reef off Pirotan Island and Hanuman Dandi.

Natica didyma (Röding) (Plate 5, Figs. 43 & 44)

Collected from Pirotan Island and Hanuman Dandi.

Natica lamarckii Chenu (Plate 5, Fig. 45)

Collected from Pirotan Island and Hanuman Dandi.

Genus **Sinum** (Bolten) Röding

The shell is very easy to identify by its characteristic depressed spire, and its finely striated body-whorl which is inflated and ovoid in shape. The shell is very thin and its inner surface is glossy and iridescent. The spire is visible only in profile. Umbilicus is absent.

Sinum cuvierianum (Récluz) (Plate 5, Figs. 46 & 47)

Collected from Pirotan Island and Hanuman Dandi.

Family CYPRAEIDAE

They are popularly known as 'cowries' and are notable for their polished surface and beautiful coloration. The shell is inrolled and the aperture looks like a long narrow slit extending from one end to the other. Both the margins of the aperture are toothed.

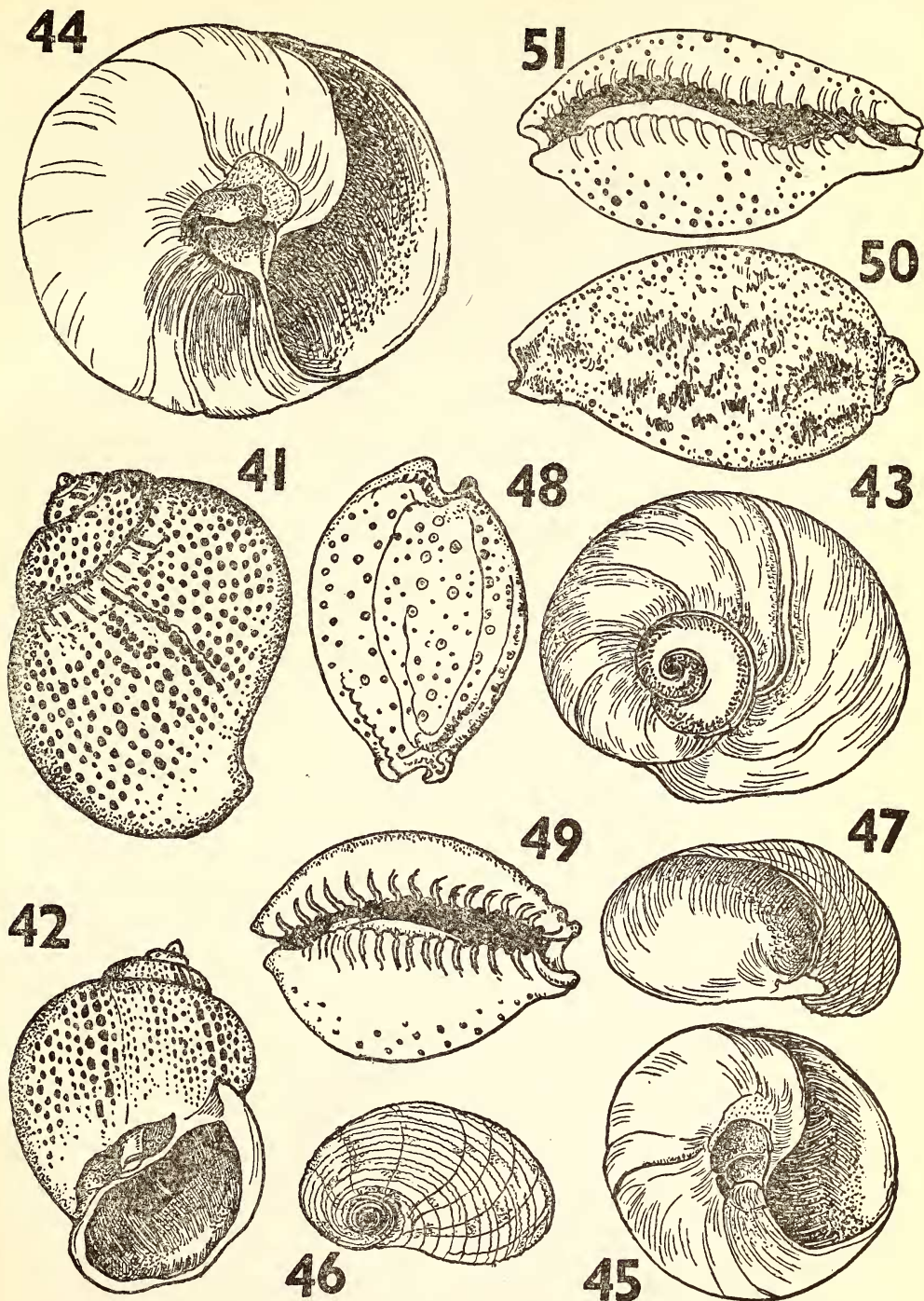


Fig. 41. *Natica tigrina* ; Fig. 42. *N. tigrina* : aperture side ; Fig. 43. *N. didyma* : from the apex ; Fig. 44. *N. didyma* : aperture side ; Fig. 45. *N. lamarcki* : aperture side ; Fig. 46. *Sinum cuvierianum* : showing the body-whorl ; Fig. 47. *S. cuvierianum* : aperture side ; Fig. 48. *Cyparea ocellata* : from above ; Fig. 49. *C. ocellata* : aperture side ; Fig. 50. *C. arabica* : from above ; Fig. 51. *C. arabica* : aperture side.

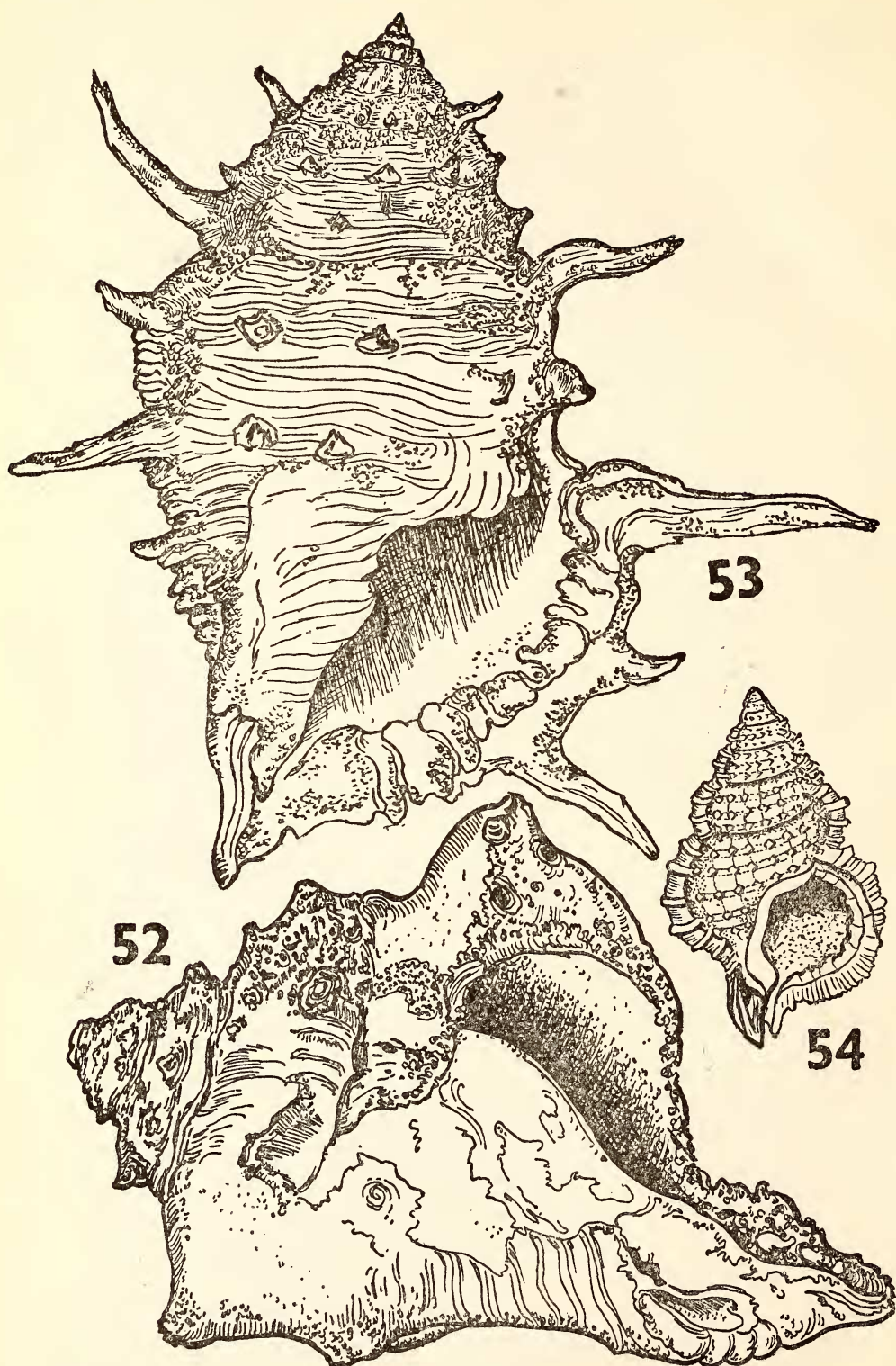


Fig. 52. *Hemifusus* sp.: aperture side; Fig. 53. *Bursa spinosa*: aperture side $\times 1\frac{1}{2}$; Fig. 54. *B. granularis*: aperture side.

Genus **Cypraea** Linn.**Cypraea ocellata** Linn. (Plate 5, Figs. 48 & 49)

Live specimens were collected from Pirotan Island.

Cypraea arabica Linn. (Plate 5, Figs. 50 & 51)

Collected from Pirotan Island.

Family **VOLEMIDAE**

This family includes shells which are commonly known as knobbed chanks

Genus **Hemifusus** Swainson

The shell is large, thick and solid. The whorls are angularly shouldered with nodule-like swellings in a row. The varices are well developed. The aperture is provided with a long anterior canal. The callus on the columella is thick and strongly wrinkled.

Hemifusus sp. (Plate 6, Fig. 52)

The species could not be identified since the shell was incomplete.

Family **BURSIDAE**

One of the most common families represented in Pirotan Island.

Genus **Bursa** (Bolten) Röding

The shell is strongly sculptured on the outer surface. In some cases spines are present and in some granules. Most characteristic feature is the presence of both the anterior and the posterior canals.

Bursa spinosa (Lamarck) (Plate 6, Fig. 53)

Collected from coral reefs off Pirotan Island.

Bursa granularis (Röding)

Collected from Pirotan Island and Hanuman Dandi.

Family **MURICIDAE**

This family has a world-wide distribution. Tropical species are numerous and include many pretty and peculiar forms ornamented with prominent ridges and spines. The shells are stoutly built, variable

in form, sometimes fusiform but more often with a shortened spire and a wide body-whorl. In many species the anterior canal is very long and narrow.

They are widely distributed in the Gulf of Kutch.

• Genus **Murex** Linn.

The shell is large with a moderately high spire. The shape is variable, often with varices bearing long spines or stout foliaceous tubercles. The aperture is rounded or ovate; columella mostly with folds; anterior canal long.

Murex trapa Röding (Plate 7, Fig. 55)

Collected from Pirotan Island.

Murex virgineus (Röding) (Plate 7, Fig. 56)

Collected from Pirotan Island.

Murex adustus Lamarck (Plate 7, Fig. 57)

Living specimens collected from Pirotan Island and Hanuman Dandi.

Genus **Thais** (Bolten) Röding

The shells are very variable in shape and size. The spines are generally short and the aperture wide. The sculpture is in the form either of tubercles or of ridges.

Thais rudolphi (Lamarck) (Plate 7, Fig. 58)

Collected from Pirotan Island and Hanuman Dandi.

Thais rugosa (Born) (Plate 7, Fig. 59)

Collected from Pirotan Island.

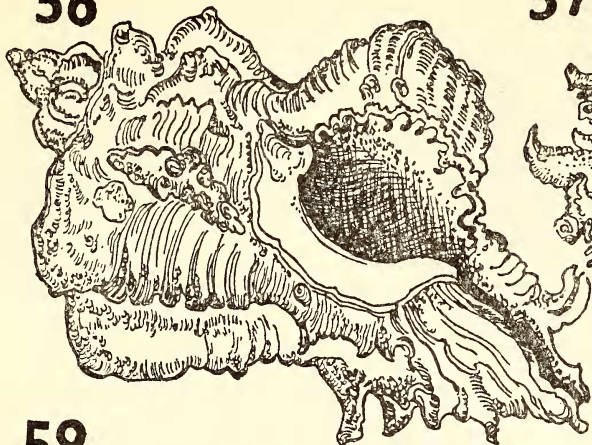
Genus **Drupa** (Bolten) Röding

The shells are small with a low spire. There is distinct sculpture on the surface. The interior of the outer lip is strongly toothed. The anterior canal is short and open.

Drupa tuberculata (Blainville) (Plate 8, Fig. 60)

Collected from Pirotan Island.

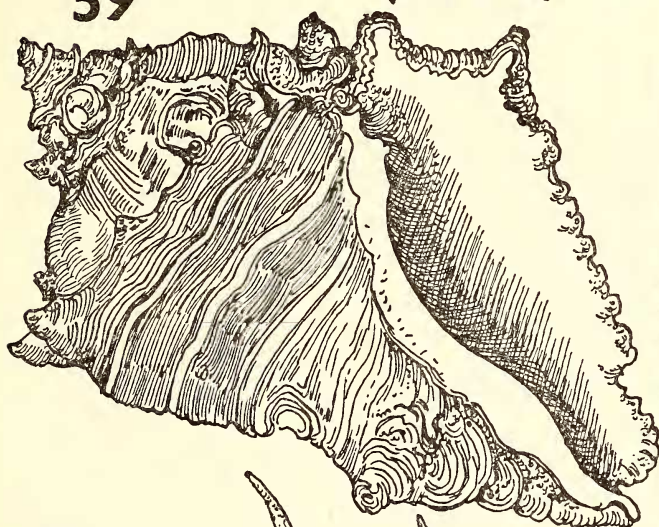
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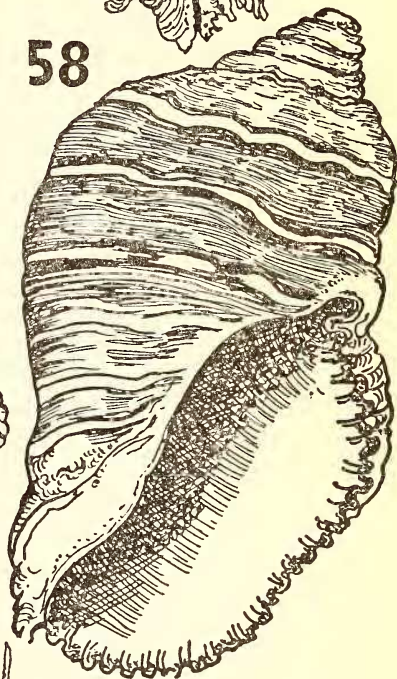
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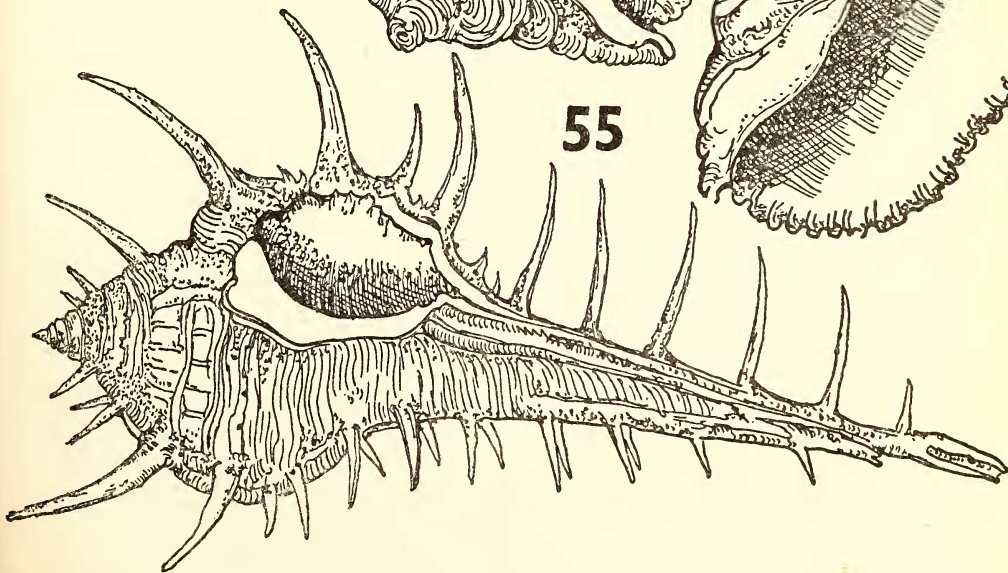


Fig. 55. *Murex trapa*: aperture side; Fig. 56. *M. virgineus*: aperture side;
 Fig. 57. *M. adustus*: aperture side; Fig. 58. *Thais rudolphi*: aperture side $\times 1\frac{1}{2}$;
 Fig. 59. *T. rugosa*: aperture side $\times 1\frac{1}{2}$.

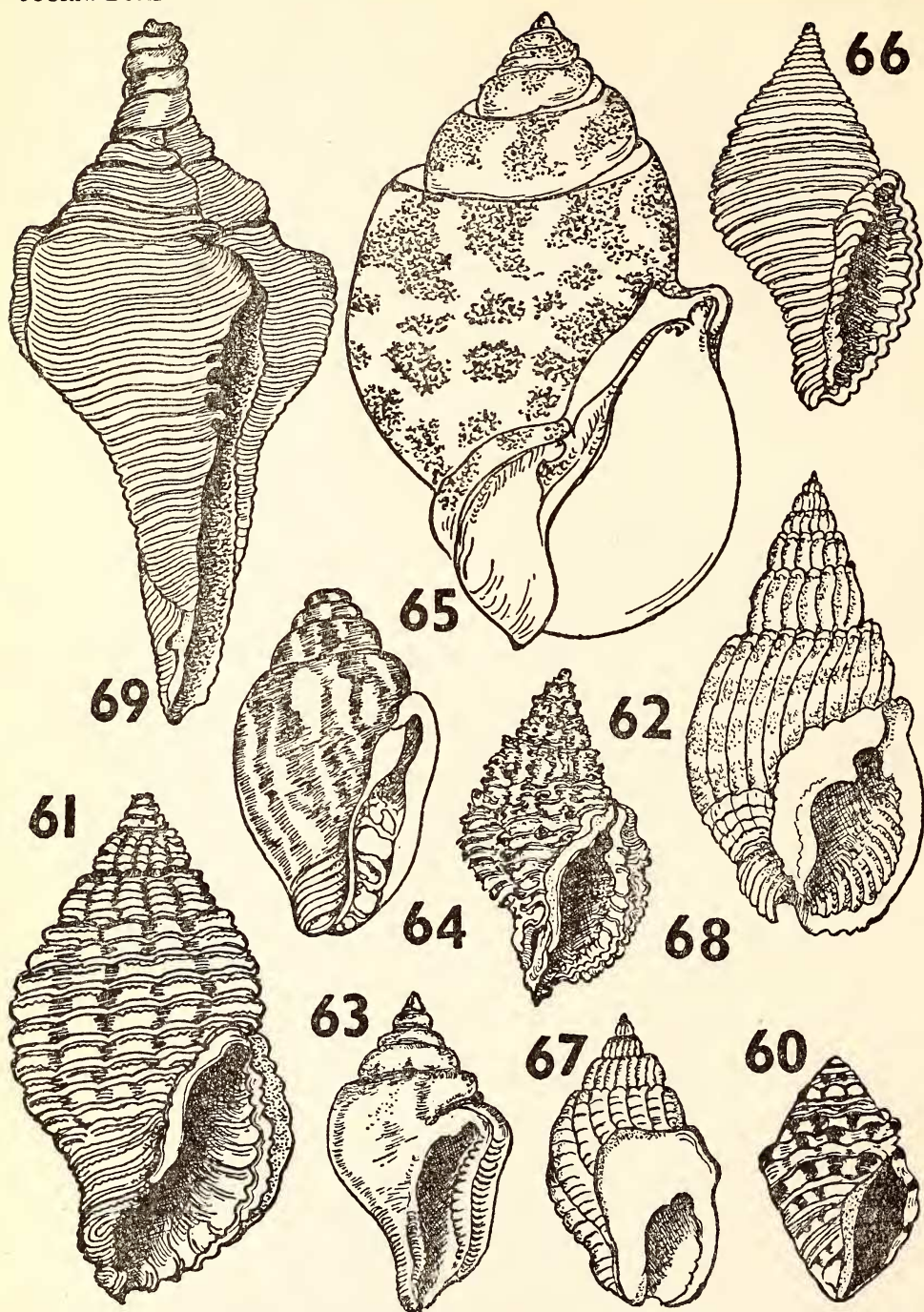


Fig. 60. *Drupa tuberculata* : aperture side $\times 1\frac{1}{2}$; Fig. 61. *D. margaritica* : aperture side $\times 1\frac{1}{2}$; Fig. 62. *D. heptagonalis* : aperture side $\times 2$; Fig. 63. *Pyrene versicolor* : aperture side $\times 3$; Fig. 64. *P. flavida* : aperture side $\times 3$; Fig. 65. *Babylonia spirata* : aperture side $\times 1\frac{1}{2}$; Fig. 66. *Cantharus undosus* : aperture side $\times 1\frac{1}{2}$; Fig. 67. *Nassa thersites* : aperture side $\times 1\frac{1}{4}$; Fig. 68. *N. hepatica* : aperture side $\times 2$; Fig. 69. *Fusus* sp. : aperture side $\times 2\frac{1}{2}$.